

Listing of Claims:

Claims 1-30 (Cancelled)

31. (Original) A sequential resonant tunneling device for back-side illumination, comprising an alternating semiconductor layer structure as follows:

| Material | | Thickness (nm) | Dopant | Doping level |
|--------------------------------------|---|-------------------|-------------|-------------------------------------|
| c-plane (0001) sapphire substrate | | Not limited | Not limited | Not limited |
| QW unit | AlN | 10 | un-doped | 0 |
| | Al _{0.2} Ga _{0.8} N | 1000 | silicon | 1x10 ¹⁸ cm ⁻³ |
| | Al _{0.27} Ga _{0.73} N | 5 | undoped | 0 |
| | GaN | 4 | undoped | 0 |
| | Al _{0.27} Ga _{0.73} N | 7 | undoped | 0 |
| | GaN | 4 | undoped | 0 |
| | ⋮ | ⋮ | ⋮ | ⋮ |
| | Al _{0.27} Ga _{0.73} N | 7 | undoped | 0 |
| | GaN | 4 | undoped | 0 |
| | Al _{0.27} Ga _{0.73} N | 5 | undoped | 0 |
| 30 QW units | GaN | 300 | magnesium | 1x10 ¹⁸ cm ⁻³ |

32. (Original) The sequential resonant tunneling device according to claim 31, further comprising metal contacts on surfaces of n and p type semiconductors.

33. (Original) A sequential resonant tunneling device for front-side illumination, comprising a multi-layered semiconductor structure, as follows:

| | Material | Thickness (nm) | Dopant | Doping level |
|------------|--|-------------------|-------------|------------------------------------|
| | c-plane (0001) | Not limited | Not limited | Not limited |
| | sapphire substrate | | | |
| | AlN | 10 | Undoped | 0 |
| | GaN | 1000 | Silicon | $1 \times 10^{18} \text{ cm}^{-3}$ |
| | $\text{Al}_{0.25}\text{Ga}_{0.75}\text{N}$ | 5 | Undoped | 0 |
| | GaN | 4 | Undoped | 0 |
| QW unit A | $\text{Al}_{0.25}\text{Ga}_{0.75}\text{N}$ | 7 | Undoped | 0 |
| | GaN | 4 | Undoped | 0 |
| | \vdots | \vdots | \vdots | \vdots |
| 30 periods | $\text{Al}_{0.27}\text{Ga}_{0.73}\text{N}$ | 7 | Undoped | 0 |
| QW unit A | GaN | 4 | Undoped | 0 |
| | $\text{Al}_{0.25}\text{Ga}_{0.75}\text{N}$ | 4 | magnesium | $1 \times 10^{18} \text{ cm}^{-3}$ |
| QW unit B | $\text{Al}_{0.33}\text{Ga}_{0.67}\text{N}$ | 4 | magnesium | $1 \times 10^{18} \text{ cm}^{-3}$ |
| | \vdots | \vdots | \vdots | \vdots |
| 25 periods | $\text{Al}_{0.25}\text{Ga}_{0.75}\text{N}$ | 4 | magnesium | $1 \times 10^{18} \text{ cm}^{-3}$ |
| QW unit B | $\text{Al}_{0.33}\text{Ga}_{0.67}\text{N}$ | 4 | magnesium | $1 \times 10^{18} \text{ cm}^{-3}$ |
| | GaN | 10 | magnesium | $1 \times 10^{18} \text{ cm}^{-3}$ |

34. (Original) The sequential resonant tunneling device according to claim 33, further comprising metal contacts on surfaces of n and p type semiconductors.

35. (Original) A sequential resonant tunneling device for front-side illumination comprising a multilayered semiconductor structure as follows:

| | | Material | Thickness (nm) | Dopant | Doping level |
|------------------------|---|--|-------------------|----------|------------------------------------|
| | | 6H-SiC substrate | Not limited | p-type | $1 \times 10^{18} \text{ cm}^{-3}$ |
| | | AlN | 10 | un-doped | 0 |
| | | $\text{Al}_{0.27}\text{Ga}_{0.73}\text{N}$ | 5 | Undoped | 0 |
| | | GaN | 4 | Undoped | 0 |
| QW unit | { | $\text{Al}_{0.27}\text{Ga}_{0.73}\text{N}$ | 7 | Undoped | 0 |
| | | GaN | 4 | Undoped | 0 |
| 30 periods QW units | { | ⋮ | ⋮ | ⋮ | ⋮ |
| | | $\text{Al}_{0.27}\text{Ga}_{0.73}\text{N}$ | 7 | Undoped | 0 |
| | | GaN | 4 | Undoped | 0 |
| | | $\text{Al}_{0.27}\text{Ga}_{0.73}\text{N}$ | 5 | Undoped | 0 |
| | | $\text{Al}_{0.2}\text{Ga}_{0.8}\text{N}$ | 1000 | Silicon | $1 \times 10^{18} \text{ cm}^{-3}$ |
| | | GaN | 10 | Silicon | $1 \times 10^{18} \text{ cm}^{-3}$ |
| | | | | | |

36. (Original) The sequential resonant tunneling device according to claim 35, further comprising metal contacts on surfaces of n and p type semiconductors.

37. (Cancelled)